PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents
United States Patent and Trademark Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 03 April 2000 (03.04.00)	
International application No. PCT/GB99/02328	**Applicant's or agent's file reference** IM/LD/P/12661.WO
International filing date (day/month/year) 04 August 1999 (04.08.99)	**Priority date** (day/month/year) 06 August 1998 (06.08.98)
Applicant LILBURN, David, Andrew	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:
03 March 2000 (03.03.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer
Olivia RANAIVOJAONA

Telephone No.: (41-22) 338.83.38

3205700

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
IM/LD/P/12661.WO		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/GB 99/ 02328	04/08/1999	06/08/1998
Applicant		
SCAPA GROUP PLC et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

   [ ] contained in the international application in written form.

   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readble form.

   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 1

   [ ] as suggested by the applicant.

   [X] because the applicant failed to suggest a figure.

   [ ] because this figure better characterizes the invention.

   [ ] None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 99/02328

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01N33/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 462 703 A (PAPER CHEMISTRY LAB INC) 27 December 1991 (1991-12-27) page 6, line 19 -page 11, line 11; figures ---	1-19
A	WO 95 34810 A (JOHN HEYER PAPER LTD ;PARKER JOHN RUSSELL (GB)) 21 December 1995 (1995-12-21) the whole document ---	1-19
A	US 3 607 083 A (CHOWDHRY ANIRUDH K) 11 May 1971 (1971-05-11) column 2, line 44 -column 4, line 14; figures ---	1-19
A	US 3 461 030 A (KEYES MARION A) 12 August 1969 (1969-08-12) column 3, line 20 -column 7, line 62; figures --- -/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 January 2000	21/01/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Bosma, R

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 99/02328

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	DE 43 21 322 A (PLEVA GMBH) 5 January 1994 (1994-01-05) the whole document -----	1-19

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/GB 99/02328

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 0462703	A	27-12-1991	AT	170002 T	15-09-1998
			DE	69130007 D	24-09-1998
			DE	69130007 T	11-02-1999
			US	5373229 A	13-12-1994
WO 9534810	A	21-12-1995	AU	2571895 A	05-01-1996
			CA	2190853 A	21-12-1995
			EP	0765474 A	02-04-1997
			FI	965009 A	16-12-1996
			US	5745365 A	28-04-1998
US 3607083	A	11-05-1971	NONE		
US 3461030	A	12-08-1969	DE	1598146 A	01-04-1971
			GB	1154350 A	04-06-1969
			SE	328468 B	14-09-1970
DE 4321322	A	05-01-1994	NONE		

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International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : G01N 33/34

A1

(11) International Publication Number: WO 00/08462

(43) International Publication Date: 17 February 2000 (17.02.00)

(21) International Application Number: PCT/GB99/02328

(22) International Filing Date: 4 August 1999 (04.08.99)

(30) Priority Data:
60/095,563 6 August 1998 (06.08.98) US

(71) Applicant *(for all designated States except US)*: SCAPA GROUP PLC [GB/GB]; Oakfield House, 93 Preston New Road, Blackburn, Lancashire BB2 6AY (GB).

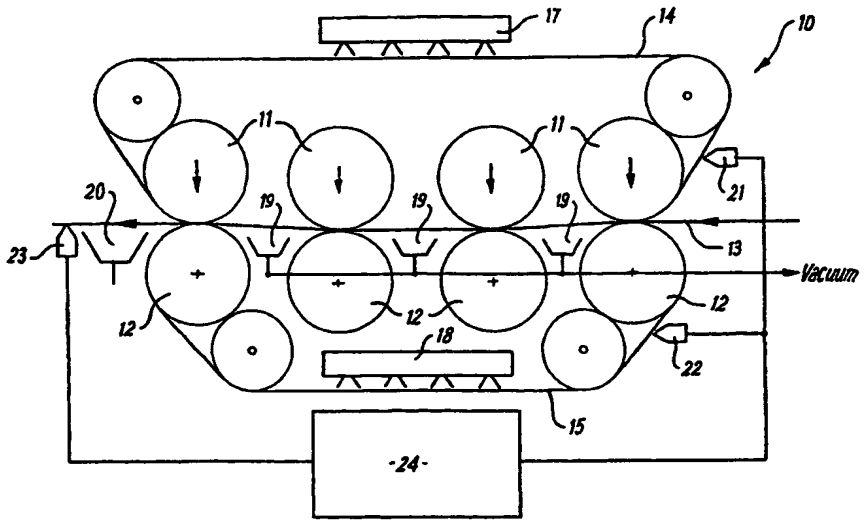
(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: LILBURN, David, Andrew [US/US]; 382 Redbud, Pittsboro, NC 27312 (US).

(74) Agents: MIDDLEMIST, Ian, Alastair et al.; Wilson Gunn M'Caw, 41–51 Royal Exchange, Cross Street, Manchester M2 7BD (GB).

(81) Designated States: CA, CN, JP, KR, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: METHOD AND APPARATUS FOR MONITORING WATER BALANCE IN A PAPERMACHINE



(57) Abstract

A press section of a papermachine has upper and lower press felts (14, 15). Electrical conductivity sensors (21, 22) measure the electrical conductivity of the felts before entry to a press section. A further electrical conductivity sensor (23) senses the electrical conductivity of a paper web (13) as it emerges from the press section. Measurements are also taken of the flow of cleaning showers (17, 18) applied to the felts, and of water removed by the dewatering devices (19) in the press section, and appropriate signals corresponding to these values are applied to a processor (24), which determines a material balance in accordance with a procedure set out in the description.

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INTERNATIONAL SEARCH REPORT

Inte. or[illegible]lication No
PCT/GB 99/02328

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01N33/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	EP 0 462 703 A (PAPER CHEMISTRY LAB INC) 27 December 1991 (1991-12-27) page 6, line 19 -page 11, line 11; figures ---	1-19
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A	US 3 607 083 A (CHOWDHRY ANIRUDH K) 11 May 1971 (1971-05-11) column 2, line 44 -column 4, line 14; figures ---	1-19
A	US 3 461 030 A (KEYES MARION A) 12 August 1969 (1969-08-12) column 3, line 20 -column 7, line 62; figures --- -/--	1-19

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 January 2000	21/01/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Bosma, R

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Inter[illegible]ication No
PCT/GB 99/02328

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 43 21 322 A (PLEVA GMBH) 5 January 1994 (1994-01-05) the whole document -----	1-19

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

...information on patent family members

Interna...cation No
PCT/GB 99/02328

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0462703 A	27-12-1991	AT 170002 T	15-09-1998
		DE 69130007 D	24-09-1998
		DE 69130007 T	11-02-1999
		US 5373229 A	13-12-1994
WO 9534810 A	21-12-1995	AU 2571895 A	05-01-1996
		CA 2190853 A	21-12-1995
		EP 0765474 A	02-04-1997
		FI 965009 A	16-12-1996
		US 5745365 A	28-04-1998
US 3607083 A	11-05-1971	NONE	
US 3461030 A	12-08-1969	DE 1598146 A	01-04-1971
		GB 1154350 A	04-06-1969
		SE 328468 B	14-09-1970
DE 4321322 A	05-01-1994	NONE	

N/C

6

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
IM/JSW/P/12661.WO		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/GB99/02328	04/08/1999	06/08/1998
International Patent Classification (IPC) or national classification and IPC		
G01N33/34		
Applicant		
SCAPA GROUP PLC et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☐ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
03/03/2000	09.11.2000
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Sembritzki, T Telephone No. +49 89 2399 8626

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB99/02328

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-11	as originally filed				

Claims, No.:

1	as originally filed				
2-19	as received on	21/10/2000	with letter of	18/10/2000	

Drawings, sheets:

1/1	as originally filed

2. The amendments have resulted in the cancellation of:

☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

see separate sheet

4. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☒ the entire international application.

☐ claims Nos. .

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

see separate sheet

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for the said claims Nos. .

Point I:

In claim 1 as originally filed it is defined, that the electrical conductivities of the water entrained in the press felts and of the water entrained in the paper web are measured. The same information can be found in the description (cf. page 5, line 17 - page 6, line 1). In contradiction to this, in claim 1 filed with letter of 18.10.00 it is defined, that frequent measurements are taken "to determine the electrical conductivity". This definition encompasses also methods, where other parameters are measured and the electrical conductivity is calculated using these parameters. This definition is therefore much broader than previous claim 1 and introduces subject-matter which extends beyond the content of the application as filed, contrary to Article 19(2) PCT. In addition further clarity problems are created, since it is not specified, which measurements could be meant.

Accordingly, the examination was carried out, as if claim 1 would not have been amended. This report is therefore based on claim 1 as originally filed.

Point III:

1. As far as it can be understood from the description, the measurement of the electrical conductivity of the water at the two points defined in independent claims 1 and 11, represents only a part of the measurements which are required to determine the material balance. It is for example necessary to determine all the incoming flows as well as their conductivity. Since it is not possible to carry out the method without the knowledge of these additional information, it is obvious, that essential features are missing (Article 6 PCT).
   In summary, it is apparent that claims 1 and 11 do not include all of the features which are necessary to solve the technical problem of the invention, or which are necessary to achieve the advantages used in the description to justify the presence of an inventive step. Hence, the requirements of Article 6 PCT as to support by the description are not met.

2. Since essential information are missing the definition of claim 1 must be regarded as "result to be achieved" so that the matter for which protection is sought is not clearly defined. The definition of claim 1 represents a statement of the underlying

problem, namely to determine the material balance using the water balance and electrical conductivities. However, the technical features necessary for achieving this result are not specified. It cannot be understood from claim 1, what the aim of such a material balance could be and how it could be determined (Article 6 PCT). Even with the information contained in the dependent claims it is not possible to carry out the method of claim 1 without undue burden within substantially the whole scope, since also in the dependent claims various clarity problems are present (see point 4. below).

3. In the method according to claim 1 the conductivity of the water entrained in the paper web on leaving the press means is measured. Contrary to this, dependent claim 6 defines a formula to calculate this conductivity thereby rendering claim 1 unclear (Article 6 PCT).

4. Neither from the claims nor from the description it can be understood, which problem could be solved by the method as defined in claim 1. In the field of process engineering it is common knowledge to use a material balance in order to determine for example unknown process streams. Such an approach comes within the usual practice of a skilled person and would not justify the presence of an inventive step.
The use of conductivities for different purposes but in order to control paper machines is for example known from EP 0462703, US 3,461,030 and WO 9534810 cited in the search report. Since the determination and use of conductivities in the field of paper machines is known, it is an obvious option for a skilled person to use this values also in balances if necessary.

In the description it is stated, that it is not possible to know dryness of the paper web as it leaves each press nip or as it finally enters the dryer section (see page 2, lines 8-9). If the problem should be the determination of the water contained in the web, this could be calculated using only the in- and outgoing water streams - all these streams have to be known also in the method as defined in the present application. However, it is unclear, why the conductivity should be measured in this case.

4. The subject-matter of the dependent claims is in several points unclear and does therefore not meet the requirements of Article 6 PCT. The following points represent only examples for the deficiencies in general:

- Some of the formulas defined in the claims are mathematically incorrect and therefore unclear. Claim 3 defines for example "Flow x Conductivity" but means probably the sum of the products of flow and conductivity. In claim 7 "wet web in" should be equal to the product of "wet web in" and the "conductivity".

- The claims comprise a mixture of text, abbreviations, units and formulas, e.g. in claim 7 it is unclear, where the text or explanation stops and where the formula starts. The definitions of the claims and their intended limitations are therefore not understandable.

- In claim 4 the weight of the wet web is defined, however, the unit "l per minute" does not define a weight but a volume flow.

- Units should be added in brackets as done only in claim 3 but not in the other claims. It is not understood, why a unit is given for the flow, but not for the conductivity. In this context it has to be stated, that the unit "gpm" used in claims 3, 7 and 9 is no SI-unit and not additionally expressed in terms of the units stipulated by Rule 10.1/(a)/and/(b) PCT.

- In claim 4,4) a flow rate f is defined, which cannot be found in the further claims. This definition seems to be meaningless.

- It is unclear, which balance covers the whole process and which balance covers only the area around one nip. It is therefore unclear, wether "Vacuum dewatering" stands for the whole vacuum dewatering flow or for the flow of only one box.

5. Due to the above clarity problems it was not possible to examine the method claims with regard to novelty and inventive step. This is also valid for the apparatus claims since they are directly related to the method claims.

In addition the definition of present claim 11 seems to cover also a usual measuring apparatus with two conductivity sensors, which is able to calculate the difference of both values. Also in this case essential features seem to be missing.

CLAIMS

1. A method of monitoring the water balance in a papermachine during operation thereof comprising taking frequent measurements to determine the electrical conductivity of the water entrained in each of one or more press felts on entry to a press means, separately taking frequent measurements to determine the electrical conductivity of the water entrained in the paper web on leaving the press means, and comparing the electrical conductivities determined to determine the material balance as the machine operates.

2. A method according to claim 1 wherein the electrical conductivities are each determined by measuring the concentration of the same specific ions at entry to and on leaving the press means, and the linear relationship between the concentrations of said ions are used to determine the electrical conductivity.

3. A method according to claim wherein the material balance is calculated using the following formula:-

   Flow (gpm) x Conductivity IN = Flow (gpm) x Conductivity OUT

4. A method according to claim 3 wherein the IN side of the equation is calculated using the following data:-

   1) Weight of Wet Web, as ℓ per min = f(kg/day % water)

   2) Wet Web conductivity measured or calculated from previous

press nip

3) Showers, as ℓ per min, = f(nozzle size, pressure)

4) Showers conductivity - measured and weight averaged, where

f = flow rate, in ℓ per min, as water.

5. A method according to claim 3 or 4 wherein the OUT side of the equation is calculated using the following data:-

1) Vacuum dewatering flow and conductivity, as measured;

2) Press water flow and conductivity, as measured;

3) Wet Web ℓ per min, as Wet Web in <u>minus</u> vacuum dewatering out, <u>minus</u> press water flow.

6. A method according to claim 5 wherein wet web conductivity at the outlet is calculated by solving the equation:-

WWI ℓ per min x WWI cond + Shower ℓ per min x Shower cond = Vacuum ℓ per min x vacuum cond + Press ℓ per min x Press cond + (WWI ℓ per min - vacuum ℓ per min - Press ℓ per min) x WWO cond,

wherein WWO cond = $\frac{A + B - C - D}{E}$, wherein

A = WWI ℓ per min x WWI cond

B = Shower ℓ per min x Shower cond

C = Vacuum ℓ per min x vacuum cond

D = Press ℓ per min x Press cond

E = WWI ℓ per min - vacuum ℓ per min - Press ℓ per min

7. A method according to claim 1 wherein the solids balance is determined from the following data:-

In

Wet Web in = WWI ℓ per min x conductivity

Shower in = Shower ℓ per min x conductivity, as measured

Out

Wet Web Out = WWO ℓ per min x conductivity, as calculated;

Vacuum dewatering = ℓ per min x conductivity, as measured;

Press Out = ℓ per min x conductivity (as measured);

Shower water flow = ℓ per min leaving press nip (Xp) + (gpm) leaving vacuum dewatering (Xu), wherein

Xu = Shower ℓ per min - Xp, and

Net Web flow out = ℓ per min leaving press nip (Yp) + ℓ per min leaving vacuum dewatering (Yu), and

Yu = Net Web outflow - Yp.

8. A method according to claim 7 wherein the vacuum box balance is determined from the following data:-

Solids out = Flow x Conductivity

Flow = Xu

Conductivity = Cu

Solids In = Solids from shower water + solids from wet web

Solids from shower water = Shower concentration (Cs) x Shower water leaving at vacuum box (Su)

Solids from wet web = Wet web conductivity (WWc) x Wet web water (WWu) leaving at Uhle box

so that Cu x Xu = WWc x WWu + Cs x Su.

9. A method according to claim 8 wherein Su = the flow rate of shower water in gallons per minute of shower water removed by the vacuum box flow, the amount of shower water removed at the press is determined as Total shower flow minus Su, and the amount of Wet Web water removed at the press is calculated by:-

Press Cond x Press flow = Wet Web cond x Wet Web flow at press, + Shower cond x Shower flow at press,

i.e. Cp x Xp = WWc x WWp + Sc x Sp,

wherein Press flow (Xp) = Wet Web flow (WWp) + Shower flow (Sp),

so that

Cp x (WWp + Sp) = WWc x WWp + Sc x Sp, and

$$WWp = \frac{Sc \times Sp - Cp \times Sp}{Cp - Wwc},$$

and the total flow at the press is determined by Xp = WWp + Sp.

10. A method according to claim 9 wherein the overall flow in and out of each nip is calculated and the measured versus calculated flows compared to allow calculation of a flow error which is then applied to the outgoing sheet to determine sheet consistency.

11. Apparatus for monitoring the water balance in a papermachine during operation thereof comprising first measuring means for taking measurements to determine the electrical conductivity of water entering a press means entrained in each of one or more press felts, second measuring means for taking measurement to determine the electrical conductivity of the water entrained in the paper web on leaving the press means, and means for comparing the measured electrical conductivities to determine the material balance as the machine operates.

12. Apparatus according to claim 11 further comprising apparatus for measuring and reporting flow rates of water applied to the felt before the press means, and of water collected from the felt and paper web in the press means.

13. Apparatus according to claim 11 or 12 including calculator means adapted to receive said measurements of electrical conductivity and flow rate and to calculate the material balance according to a method as set out in any one of claims 1 to 10.

14. Apparatus according to any of claims 11 to 13 wherein the press means comprise the entire press section of a papermachine, said section comprising a plurality of serially arranged roller nips.

15. Apparatus according to any of claims 11 to 13 wherein the press means comprise a single roller nip.

16. Apparatus according to any one of claims 11 to 15 wherein the means for measuring the electrical conductivity of the water each comprise an electrohydrodynamic induction flow meter.

17. Apparatus according to claim 16 wherein a first such measuring means is located adjacent to an upper press felt immediately before its entry to a press section of a papermachine.

18. Apparatus according to claim 17 wherein a second such sensing means is located adjacent to a lower press felt immediately before its entry to said press section.

19. Apparatus according to claim 18 wherein a further such sensing means is located adjacent a paper web immediately after its emergence from said press section.